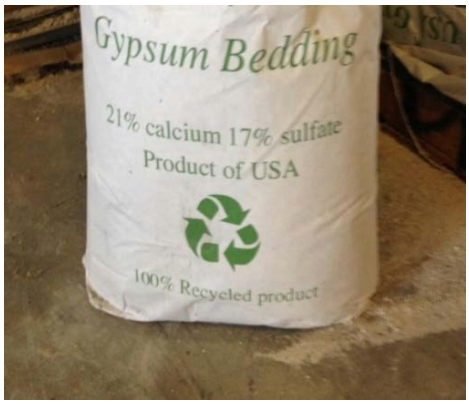
Gypsum Bedding in Long-Term Manure Storage May Create Dangerous Conditions

FARMERS AND MANURE HANDLERS NEED TO *AVOID EXPOSURE* TO MANURE GASES PRODUCED BY LONG-TERM MANURE STORAGES, ESPECIALLY WHEN GYPSUM IS USED FOR BEDDING

DANGEROUS LEVELS HAVE BEEN MEASURED!

All stored manure can produce gas levels of concern in some conditions. Some gases (like hydrogen sulfide [H_2S]) are toxic and heavier than air and therefore are prone to sink to low areas like storage pits, sumps, or other depressions. These areas are the most dangerous. When mixed before spreading, manure pits and storages that hold manure from barns where gypsum is used for cow bedding may be at increased risk to release H_2S gas at levels that are hazardous and could even be life threatening. As wind currents mix H_2S with air, the hazard is quickly reduced so the main concern is the area right around manure storage, especially during agitation.



Why is gypsum a potential concern? Gypsum is a significant source of calcium and sulfur. Though both calcium and sulfur are beneficial in the right place and form, some naturally occurring bacteria in liquid manure storages use the sulfur to make hydrogen sulfide. The bacteria are most active in warmer months, so summer and fall pit agitation can be more dangerous. We recently learned that gypsum cannot currently be used as bedding on farms in the United Kingdom due to the health risk concerns with hydrogen sulfide emissions from manure storages.

In October 2013, staff from the Benton fire department and Yates Soil and Water Conservation District (SWCD) measured more than 100 ppm hydrogen sulfide next to a long-term manure storage pit during agitation on a farm where gypsum has been used for bedding. In certain conditions, hydrogen sulfide can be a problem in any long-term storage, but the level found here is much higher than we have seen measured in other locations. It is not fully clear if gypsum is a source of the problem, and more testing is needed to better assess the situation. However, gypsum is major source of sulfur in some pits and due to the potential threat to health and safety, we are recommending caution. Air was also tested around the perimeter of a long-term manure storage on a Yates County farm that does not use gypsum for bedding and H_2S levels were overall undetectable.

Hydrogen sulfide levels above 20 ppm can begin to cause humans problems including headaches, dizziness, and fatigue. According to the Occupational Safety and Health

Administration (OSHA), a concentration of 100 ppm hydrogen sulfide is immediately dangerous to life and health because the symptoms can make it hard to escape from a dangerous situation. Levels over 100 ppm paralyze the olfactory nerve (sense of smell) causing the victim to not know they are still breathing in the gas, and exposure at this level for 48 hours may cause death. At levels above 500 ppm, staggering and collapse can occur in 5 minutes, death after 30-60 minutes. If we are finding random air samples over 100 ppm, it is possible to have pockets of hydrogen sulfide near storage structures during agitation that are at much higher levels.

Farmers, family members, workers, and visitors are <u>urged</u> to avoid any and all manure gases, especially from storages when gypsum is mixed in with manure in any significant quantities. Note: for operations that daily haul manure and use gypsum for bedding, we expect little or no production of hydrogen sulfide, but care should be taken to minimize risks there too.

More testing will be done this fall in the Yates County area on farms that have used gypsum and those that have not. ***If you have stored manure with gypsum material and are planning to agitate and land apply manure from that storage this fall, the following precautions should be taken:***

- Make sure no unnecessary people are near the pit or open air storage during agitation and pump out.
- Set up large fans and/or blowers around where operators will be working to mix air and dilute any gases.
- Pit operators should be trained to use respirators and how to work in hazardous places.
- Use a respirator when working around the pit during agitation and filling.
- Do not enter pits, tanks or open air depressions (low areas) without a respirator!
- If entry is necessary, never do so during agitation. Enter only if the pit is well ventilated, fresh air is supplied to a respirator and a safety harness and attached rope is worn and there are two people standing by to help.

In addition to the above tips, farmers should:

- Consider using other materials for bedding until this issue is better understood.
- Have an emergency plan in place.
- Train all family members and employees in the dangers of manure gases.
- Install gating/fencing and danger signs around all manure storages.

A portion of this information is summarized from an article produced by Pennsylvania Farm Bureau and US Department of Labor, OSHA division website

Tom Eskildsen, Yates SWCD
Nancy Glazier, Cornell CCE
Curt Gooch and Karl J. Czymmek, Cornell PRO-DAIRY